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SAFETY SPECIFICATION FOR THE PULSED FAST NEUTRON ANALYSIS (PFNA) CARGO INSPECTION SYSTEM AT YSLETA PORT OF ENTRY COMMERCIAL CARGO FACILITY

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This document provides safety procedures for the Pulsed Fast Neutron Analysis (PFNA) Cargo Inspection System at Ysleta Port of Entry Commercial Cargo Facility located in El Paso, Texas.

PFNA technology will be used for determining the presence of contraband, drugs, and weapons, etc., in cargo containers and trucks. This technology measures the elemental contents (e.g., oxygen, nitrogen, etc.) within volume segments of a scanned object. These measurements are used to generate three-dimensional "maps" of the object's elemental composition. The amounts and relative concentrations of key elements are used to identify specific substances of interest (e.g., explosives, narcotics, etc.). A system has been designed to use this technology for inspecting vehicles, such as trucks and tractor trailers.

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FOREWORD

This document provides safety procedures for the Pulsed Fast Neutron Analysis (PFNA) Cargo Inspection System at Ysleta Port of Entry Commercial Cargo Facility located in El Paso, Texas.

PFNA technology will be used for determining the presence of contraband, drugs and weapons, etc., in cargo containers and trucks. This technology measures the elemental contents (e.g., oxygen, nitrogen, etc.) within volume segments of a scanned object. These measurements are used to generate three-dimensional "maps" of the object's elemental composition. The amounts and relative concentrations of key elements are used to identify specific substances of interest (e.g., explosives, narcotics, etc.). A system has been designed to use this technology for inspecting vehicles, such as trucks and tractor trailers.

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1. RADIATION SAFETY REQUIREMENTS

The accelerator **shall** be operated in accordance with standards specified in Chapter 10, Part 20, of the Code of Federal Regulations (10 CFR 20).

The maximum permissible whole body dose for a radiation worker **shall** be no more than 5 rem/year. Technicians who perform maintenance on the Pulsed Fast Neutron Analysis (PFNA) Cargo Inspection System (hereafter referred to as the "PFNA") will be "Radiation Workers" to whom this higher occupational level applies.

The PFNA **shall** be capable of being operated under normal circumstances without a radiation worker present. The PFNA Operator **shall** work in a location where the exposure is less than 50 microrem/hour.

2. SHIELDING AND SAFETY DESIGN REQUIREMENTS

The accelerator installation **shall** be provided with such primary and secondary barriers as are necessary to assure radiation exposure **shall not** exceed 50 microrem/hour above natural background radiation at any point five (5.0) centimeters or greater outside the vertical surfaces of the facility.

The accelerator installation **shall** be provided with such primary and secondary barriers as are necessary to assure the effect of skyshine or other reflected radiation maintains the less than 50-microrem level above natural background radiation as measured five (5.0) centimeters or greater outside the vertical surfaces of the facility.

The maximum exposure to a person inadvertently exposed to radiation inside the tunnel **shall** be less than 100 millirem/single-side vehicle scan. The speed of the vehicle through the PFNA, the speed of the scan arm of the PFNA, and the beam intensity **shall** be monitored, and the generation of the PFNA external neutron beam stopped automatically should the system be operating at levels that exceed normal parameters or that approach the levels of this requirement. Images and controls **shall** be in place to ensure that the PFNA Operator declares the vehicle clear of personnel before the vehicle is released or sent for additional PFNA scans.

A tow vehicle that encounters an out-of-specification operating condition **shall** stop.

3. PARTICLE ACCELERATOR CONTROLS AND INTERLOCK SYSTEMS

Instrumentation, readouts, and controls on the particle accelerator control console **shall** be identified and discernible.

Doors to the areas of the facility where an individual could receive a radiation dose in excess of 50 microrem/hour **shall** be provided with safety interlocks that shut down generation of the PFNA external neutron beam under conditions of barrier penetration or opening(s). Safety interlocks **shall** accommodate PFNA Cargo Inspection Equipment

maintenance modes that differ from the PFNA Cargo Inspection Equipment operating mode. Maintenance workers could receive a radiation dose that is consistent with performing their duties under the "Federal Radiation Standards."

Each safety interlock **shall** be on a circuit that **shall** allow it to operate independently of all other safety interlocks, meet building code requirements, and be installed per manufacturer's recommended procedures.

All safety interlocks **shall** operate within specifications. Any out-of-specification condition **shall** stop the generation of the PFNA external neutron beam.

When a safety interlock system has been tripped, it **shall** only be possible to resume operation of the accelerator by manually resetting controls at the position where the safety interlock has been tripped and, lastly, at the main control console.

An E-STOP button or other emergency cutoff device **shall** be located and easily identifiable in all high-radiation areas and at each entrance into the inspection tunnel. Such a cutoff switch **shall** include a manual reset so that the generation of the PFNA external neutron beam cannot be restarted from the operator's console without resetting the cutoff device.

An E-STOP button or other emergency cutoff device **shall** be located and easily identifiable on the control panel of the PFNA system. This **shall** be used (1) if an individual is in an area of high radiation, (2) if the speed of the tow mechanism is too slow, (3) if the beam strength is too high, (4) if the scan arm rate is too low or (5) if any combination of these events would expose a person inadvertently to radiation in excess of 100 millirem/hour. Such a cutoff device **shall** include a manual reset.

4. WARNING DEVICES

Each location where an individual could receive a radiation dose in excess of 50 microrem/hour and entrances to these locations **shall** be equipped with easily observable warning lights that operate when, and only when, radiation is being produced.

All areas **shall** have observable indicators that the PFNA system is on but not generating an external neutron beam.

Except in facilities designed for human exposure, each area where an individual could receive a radiation dose in excess of 50 microrem/hour **shall** have both visible and audible warning devices that **shall** be activated for 15 seconds prior to the generating of the PFNA external neutron beam. Such warning devices **shall** be clearly discernible in and near all affected areas.

Prior to generation of the PFNA external neutron beam, the PFNA Operator **shall** visually verify that the tunnel area is empty of personnel, and the access doors **shall** be closed and the interlock switches set. There **shall** be a physical input by the PFNA Operator to verify that this inspection has been done before the scan can proceed.

Barriers, temporary or otherwise, and pathways leading to areas where an individual could receive a radiation dose in excess of 50 microrem/hour **shall** be posted in accordance with current radiation safety standards and regulations.

5. OPERATING REQUIREMENTS

To prevent unauthorized use, a control panel key and password **shall** be required to operate the PFNA system.

A copy of the current operating and the emergency procedures **shall** be supplied with the PFNA Inspection System and **shall** be considered part of the control panel.

The safety camera system **shall** have a port that allows an operator to attach video equipment to record camera output.

6. RADIATION-MONITORING REQUIREMENTS

Radiation levels inside the (1) inspection tunnel and (2) accelerator room **shall** be monitored, and monitors **shall** provide readouts at the control panel.

All monitoring devices **shall** be electrically independent of the accelerator control and safety interlock systems and **shall** meet code requirements.

7. VENTILATION SYSTEMS

Ventilation systems **shall** be provided to ensure that personnel entering any area where airborne tritium may be produced **shall not** be exposed to airborne tritium in excess of an effective dose equivalent limit of 10 millirem/year.

The PFNA facility **shall not** vent, release, or otherwise discharge airborne tritium to the surrounding environs such that any individual could receive a resulting dose in excess of 10 millirem/year.

The design of the venting system **shall** assure that all vented tritium is in compliance with the U.S. Environmental Protection Agency (EPA) "exempt" air concentration limit. Compliance **shall** be determined using the release and design parameters (stack height, activity, air volume, etc.) in running the EPA "Comply" computer code.

8. NOISE-LEVEL REQUIREMENTS

All noise levels, as measured outside the PFNA facility during operation, **shall** be below 85 decibels and in total compliance with Federal standards and regulations, specifically those of the Occupational Health and Safety Administration (OSHA).

9. STORAGE-OF-HAZARDOUS-MATERIALS REQUIREMENTS

All non-radiological hazardous material stored in or on the PFNA facility **shall** be in a properly labeled fire-retardant locked cabinet or other approved container in compliance with Federal regulations and standards, specifically the EPA and OSHA.

Prior to disposal as Low-Level Radioactive Waste (LLRW), all radiological material stored in the PFNA facility **shall** be stored in a lead-lined storage container to maintain radiation exposure levels in compliance with Federal Radiation Standards.

10. INDUSTRIAL SAFETY REQUIREMENTS

Safety standards for most industrial environments are well established (OSHA 29 CFR 1910), and this section merely points out certain specific industrial hazards that are often found in accelerator facilities.

Electric circuits and interconnections **shall** be wired and installed in accordance with accepted electrical building codes.

Fire extinguishers of the appropriate type to combat electrical or solvent fires **shall** be conspicuously installed around the PFNA facility.

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